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ABSTRACT

This report describes the instructional quality inventory (IQI), which was developed to provide quality control/evaluation procedures for the instructional system development (ISD). The ISD is described as a method used by the military to develop or revise training courses. IQI procedures are detailed in six sections. Section 1 explains the IQI classification system, which classifies instructional parts (objectives, tests, and presentations) according to performance tasks and instructional content. Section 2 reviews the IQI steps, which are used to determine if each objective is adequate for further instructional development. The third section outlines the process used to determine whether test items are consistent with objectives and whether each item is adequate. The following section provides guidelines for insuring that the presentations are consistent with the objectives and the test items and are adequate. In section 5 rules for assessing presentation adequacy are presented. The final section reviews the resources needed to use the IQI. (Author/CSS)

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THE INSTRUCTIONAL QUALITY INVENTORY: I. INTRODUCTION AND OVERVIEW

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Instructional System Development (ISD), a systematic method for developing military instruction, is used by the military services to develop or revise a large portion of the training courses. The Instructional Quality Inventory (IQI) was developed to provide quality control/evaluation procedures for ISD. This report is designed to acquaint managers of instructional development efforts, evaluators of instruction, contract monitors, and others with the IQI process.

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FOREWORD

The Instructional Quality Inventory (IQI) was developed in support of Navy Decision Coordinating Paper, Education and Training Development (NDCP-Z0108-PN), under subproject P.30A, Adaptive Experimental Approach to Instructional Design, and the sponsorship of the Director of Naval Education and Training (OP-99). The overall objective of the subproject is to develop an empirically-based instructional design support system to aid developers in deciding on instructional alternatives based on cost/benefits and specified resource limitations. The purpose of the IQI, which was originally called the Instructional Strategy Diagnostic Profile (ISDP), is to provide quality control and/or evaluation procedures for instructional development.

A number of reports have been published on the IQI/ISDP. The first provided an interim training manual for the ISDP (NPRDC Special Report 77-14), and the next three addressed its empirical and workshop evaluations (NPRDC Technical Reports 77-25 and 77-43 and Special Report 78-17). As a result of these evaluations, the ISDP was extensively revised and retitled as the IQI. These revisions were included in NPRDC Technical Note 78-5, which provided an interim training manual for the IQI.

This report is the first in a series of four on IQI procedures. The remaining three reports, to be published in early 1979, include:

1. An IQI User's Manual, which will include a complete description of all IQI procedures, and provide examples of their use.

2. An IQI Training Workbook, which will provide additional examples, along with practice on the IQI procedures.

3. An IQI Job Performance Aid, which will provide a brief version of each IQI procedure.

When these four reports have been published, previous training manuals (NPRDC Special Report 77-14 and Technical Note 78-5) will have been superseded.

The IQI is intended for use by the Chief of Naval Education and Training; the Chief of Naval Technical Training; the Chief of Naval Education and Training Support (specifically, the Instructional Program Development Centers); the Commander Training Command, Atlantic; the Commander Training Command, Pacific; and all other Navy activities concerned with the development, revision, or acquisition of instructional programs. Prospective users of the IQI are invited to contact this command for assistance in implementation.

DONALD F. PARKER
Commanding Officer

SUMMARY

Problem

Modern military instruction is developed according to a systematic method called Instructional Systems Development (ISD). This method includes the following steps:

1. Job/task analysis leading to specification of training objectives.

2. Development of tests to measure student progress toward the objectives.

3. Design of new instruction and/or adaptation of existing instruction to achieve the objectives.

4. Implementation of the training program.

5. Evaluation and feedback for course maintenance.

Various military activities are using this method to develop or revise many of their training courses. Thus, it is important that quality control and/or evaluation procedures be developed for use with ISD. Such procedures are needed so that:

1. Quality can be maintained throughout instructional design. Thus, errors made early in the development process will not be magnified as development proceeds.

2. Existing materials can be evaluated with respect to newly derived training objectives, so that they can be modified or revised if necessary.

3. Performance deficiencies of course graduates can be traced to possible deficiencies in instructional materials.

4. Instructional materials obtained through contract efforts can be evaluated before they are accepted.

Purpose

The purpose of this research and development effort was to develop quality control/evaluation procedures for the three main products of an instructional development effort; that is, objectives, tests, and instructional materials or presentations. These procedures are intended for use by military instructional design and development personnel.

Background

The Instructional Strategies Diagnostic Profile (ISDP) was originally developed by Courseware, Inc. under contract to the Navy Personnel Research and Development Center (Merrill, Richards, Schmidt, & Wood, 1977). Its purpose was to provide a method for diagnosing defects in instructional materials.

Finally, the IQI is intended for use by people who are familiar with ISD; it cannot be used by untrained personnel. Also, its application depends upon a good task analysis or the availability of subject matter experts--and preferably both. This is because the IQI assumes that what needs to be taught has already been determined.

This report provides an introduction to and overview of the IQI procedures. It is designed to acquaint managers of instructional development efforts, instruction evaluators, and contract monitors with the IQI. While it provides a substantive overview of the IQI process, it is not a complete IQI training program.

The following reports in the IQI series will be available in early 1979:

1. A User's Manual, which will include a complete description of all IQI procedures, and provide examples of their use.

2. A Training Workbook, which will provide additional examples and practice on the IQI procedures.

3. A Job Performance Aid, which will provide a brief version of each IQI procedure.

Conclusions

In previous empirical tests and in field workshops, it has been shown that the IQI is an effective method for assuring the quality of instructional programs. In addition, there is great user interest in the IQI; over 300 copies of previous versions of the IQI have been distributed, and workshops on earlier versions have been given for many Navy commands. Based on feedback from workshop participants, the IQI appears to be a very useful addition to Navy instructional design and development methods.

Recommendations

1. This report, and the forthcoming IQI user and training manuals, should be published as NAVEDTRA publications, and made an official part of Navy instructional design and development procedures.

2. The IQI should be considered for use by Training Program Coordinators in the Naval Technical Training Command (and other commands concerned with training management) as an evaluation and quality control tool.

3. The IQI procedures should be considered for adoption in the Instructional Program Development Centers under the Chief of Naval Education and Training Support.

4. The IQI procedures should be considered for use by technical monitors of contracts for training programs as evaluation/acceptance tools.

5. The IQI procedures should be considered for inclusion in instructor training for those instructors who will have curriculum development responsibility.

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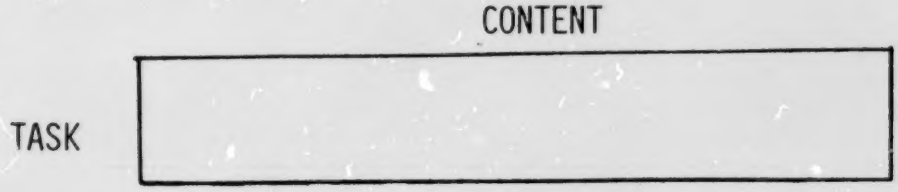
INSTRUCTIONAL QUALITY INVENTORY PROCEDURES

THE CLASSIFICATION SYSTEM:

The following classification system is used in all IQI procedures. It is applied to the three main parts of instruction: objectives, tests, and instructional presentations.

Each objective, test item, or piece of presentation, can be classified according to:

1. What the student must do, i.e., the TASK to be performed, and
2. The type of information the student must learn, i.e., the instructional CONTENT.



In the IQI, these two classification dimensions have been combined to form the TASK/CONTENT MATRIX.

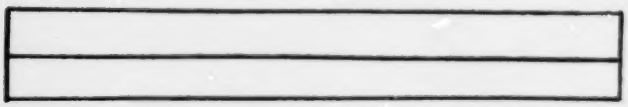
THE TASK DIMENSION:

There are two main TASKS a student can perform:

1. He can REMEMBER information, or
2. He can USE the information to do something.

REMEMBER

USE



EXAMPLE:

Here are two test items:

1. The symbol for resistor is _____.
2. Using your knowledge of electronic theory, what would happen in the circuit shown below if the load resistance were shorted?

These two test items differ with respect to what the student is supposed to do (TASK). *In number 1, the student has to* REMEMBER *something, and in number 2, the student has to apply or* USE *his knowledge in a new situation.*

THE CONTENT DIMENSION:

There are five types of CONTENT:

	FACT	CONCEPT	PROCEDURE	RULE	PRINCIPLE
REMEMBER					
USE					

FACTS are simple associations between names, objects, symbols, locations, etc.

CONCEPTS are categories or classifications defined by certain specified characteristics.

PROCEDURES consist of ordered sequences of steps or operations performed on a single object or in a specific situation.

RULES also consist of ordered sequences of operations, but can be performed on a variety of objects or in a variety of situations.

PRINCIPLES involve explanations or predictions of why things happen in the world. That is, they concern predictions or interpretations based on theoretical or cause-effect relationships.

NOTE: Facts can only be remembered. The others can be remembered or used.

EXAMPLES:

The following examples illustrate the five content areas for the REMEMBER *task level:*

REMEMBER FACT	1.	*The symbol for resistor is _____.*
	2.	*The student will list the names of the parts in the wind indicating instrument.*
REMEMBER CONCEPT	1.	*List the defining characteristics of a jet pump.*
	2.	*The student will define the various kinds of clouds (cumulus, stratus, etc.).*
REMEMBER PROCEDURE	1.	*List in order the steps for cleaning an M-16 rifle.*
	2.	*The student will describe the procedure for preparing and sending a radio message.*
REMEMBER RULE	1.	*List the steps involved in finding the rhumb-line course between two points on the earth.*
	2.	*The student will state the general rule for solving for circuit current, given voltage and resistance.*
REMEMBER PRINCIPLE	1.	*State the principles of electron movement in a semiconductor junction.*
	2.	*The student will recall the reasons why hydraulic fluid contamination must be avoided.*

Facts can only be remembered, but for the other content types, the student may be asked to USE *his knowledge to classify, perform, solve, or predict. The following are examples of the* USE *task level for all content types except facts:*

USE CONCEPT	1.	*Which of the pumps aboard ship are jet pumps?*
	2.	*Given photographs of clouds, the student will sort them according to type (cumulus, stratus, etc.).*
USE PROCEDURE	1.	*Clean an M-16 rifle.*
	2.	*The student will prepare and send a radio message.*
USE RULE	1.	*Calculate the rhumb-line course from Pearl Harbor to Long Beach.*
	2.	*Given the values for voltage and resistance, the student will calculate the current flow.*
USE PRINCIPLE	1.	*Describe the theoretical movement of electrons in a PNP transistor.*
	2.	*The student will predict what is likely to occur if the landing gear fluid were contaminated.*

THE USE LEVEL CAN BE FURTHER DIVIDED INTO TWO TYPES:

1. USE-UNAIDED in which the student has no aids except his own memory.

2. USE-AIDED in which the student has a job aid for performing the task.

For this level, the nature of the aid depends on the content type:

For USE-AIDED CONCEPTS *the aid should consist of a decision strategy, including each critical characteristic, and the decision to be made according to presence or absence of that characteristic. In simple cases, the aid may only include a list of characteristics; the decision strategy is then implied.*

For USE-AIDED PROCEDURES *the aid would be a list of steps to be performed.*

For USE-AIDED RULES *the aid would be at least a statement of the formula or rule to be applied, and could include guidelines for when and how to apply it.*

For USE-AIDED PRINCIPLES *the aid would also be at least a statement of the principle, and could include guidelines for when and how to apply it.*

EXAMPLES:

USE-AIDED: *A pilot's preflight checklist is a* USE-AIDED *procedure. The pilot does not have to remember the steps or their order because they are on the checklist. The pilot does need to perform the steps correctly.*

USE-UNAIDED: *"The student will field-strip an M-16 rifle." Here, the student must remember the steps in the correct order, and perform them correctly.*

In summary, the REMEMBER level involves "pure" remembering,

the USE-UNAIDED level involves remembering what is to be used, and then using it, and

the USE-AIDED level involves "pure" using.

THE ENTIRE TASK / CONTENT MATRIX IS SHOWN BELOW:

	FACT RECALL OR RECOGNIZE NAMES, PARTS, DATES, PLACES, ETC.	CONCEPT REMEMBER CHARACTERISTICS, OR CLASSIFY OBJECTS, EVENTS OR IDEAS ACCORDING TO CHARACTERISTICS	PROCEDURE SEQUENCE OF STEPS REMEMBERED OR USED IN A SINGLE SITUATION OR ON A SINGLE PIECE OF EQUIPMENT	RULE REMEMBER OR USE A SEQUENCE OF STEPS WHICH APPLY ACCROSS SITUATIONS OR ACROSS EQUIPMENTS	PRINCIPLE REMEMBER, OR INTERPRET / PREDICT, WHY OR HOW THINGS HAPPEN, OR CAUSE-EFFECT RELATIONSHIPS
REMEMBER - RECALL OR RECOGNIZE FACTS, CONCEPT DEFINITIONS, STEPS OF PROCEDURES OR RULES, STATEMENTS OF PRINCIPLE					
USE-UNAIDED - TASKS WHICH REQUIRE CLASSIFYING, PERFORMING A PROCEDURE, USING A RULE, EXPLAINING OR PREDICTING WITH NO AIDS EXCEPT MEMORY.					
USE-AIDED - SAME AS USE-UNAIDED, EXCEPT JOB AIDS ARE AVAILABLE.					

Any objective, test item, or piece of instruction will be classifiable in one and only one cell of the matrix above.

This matrix is used in all IQI steps.

OBJECTIVE ADEQUACY:

The first step in the IQI procedure corresponds with the development of training objectives. The procedure described below is used to determine if each objective is adequate for further instructional development.

Objectives are ADEQUATE if they satisfy three general criteria:

1. Is the objective CORRECTLY STATED? *Does the objective include statements of actions the student is to perform after training, the conditions under which the performance is expected, and the standards which the performance must meet? If even one of these parts is missing, the objective is inadequate because training for it cannot be designed or evaluated.*

   EXAMPLE: Inadequate objective: "The student will prepare a standard Navy message." This is inadequate because it does not specify either the conditions (given a typewriter? TTY?) or the standards (how fast and how many errors).

2. Is the objective CLASSIFIABLE on the task/content matrix? *If the objective cannot be classified, this means that the action the student is to perform is not stated clearly enough so that we know what the student is to do. Training cannot be designed or evaluated in these circumstances.*

   EXAMPLE: The objective "The student will learn repair procedures for the XYZ radar set" is not classifiable. It is not clear whether the student should remember the procedures or actually use them.

3. Is the "intent" of the objective APPROPRIATE for the purpose of the course? *The actions, conditions, and standards specified in the objective should be as close as possible to the actions, conditions, and standards of the task to be performed on the job after training.*

   In addition, it is assumed that the ultimate "intent" of any training program is to teach the student how to do something (i.e., USE level). Therefore, there must be a USE-level objective for each REMEMBER objective. (Facts are a special case: Although facts are not used, they often must be taught to provide a knowledge base for a later use-level task. Therefore, in order to justify teaching facts, they must support some use-level objective.)

   Conversely, USE-UNAIDED tasks should be taught at the REMEMBER level before being taught at the USE level. Therefore, just as every REMEMBER objective should have a corresponding USE objective, every USE objective should have a previous REMEMBER objective.

   EXAMPLE: The objective "The student will identify the connection of a voltmeter to measure the voltage across a component by selecting an illustration" is not appropriate for the intent of the course. The student will not see possible illustrations of connections on the job, but will be required to set up the connection, thus the action should be revised.

TEST CONSISTENCY AND ADEQUACY:

Once objectives are adequate, test items can be developed. The next IQI step is the quality control step for test development. This step involves determining whether test items are CONSISTENT *with objectives, and whether each item is* ADEQUATE.

A test item is CONSISTENT with its objective if:

1. The ACTION (TASK/CONTENT level) of the test item is the same as that of the objective.

2. The CONDITIONS under which the item is administered are as close as possible to those of the objective.

3. The STANDARDS in the test item, or the STANDARDS for scoring the item, are as close as possible to the standards in the objective.

EXAMPLE: *Objective:* *Given the necessary tools and an operator's manual, the student will set up and operate a double-acting reciprocating pump, in five minutes and according to the manual specifications.*

Inconsistent test item: *"List the steps of procedure for starting, operating, and stopping a double-acting reciprocating pump."*

This test item is inconsistent, because its TASK/CONTENT is REMEMBER-PROCEDURE instead of USE-AIDED-PROCEDURE. Notice that the action the student is to perform in the test is not the same as the action required in the objective.

Consistent test item: *"Use the operator's manual, and necessary tools to set up and operate a double-acting reciprocating pump. You will pass this test if you complete this task within 5 minutes, in accordance with the manual specifications."*

This test item is consistent with the objective. Notice, however, that if either the conditions or grading standards had been left out, the item would have been inconsistent.

4. The FORMAT of the test item is appropriate for the TASK/CONTENT level.

EXAMPLE: *"The steps in the procedure for operating a jet pump are listed below. Arrange them in the correct order."*

This is an inappropriate format for REMEMBER-PROCEDURE because the student doesn't have to remember the procedure, only recognize the steps.

Note: Recognition items (multiple choice, matching, true-false) are usually NOT *appropriate test formats for REMEMBER level objectives. This is because these items do not reflect typical job-performance requirements.*

Multiple choice, matching, and true-false items are appropriate for concept recognition, and can be appropriate for USE level objectives if they are carefully designed. However, for USE level objectives, "hands-on" performance tests are usually most appropriate.

After a test item is consistent with its objective, the test item is ADEQUATE if:

1. The item is clear and unambiguous.

2. The item does not give away its own answer or the answer to any other item on the test.

3. The item is well constructed.

4. Other adequacy concerns covered in the IQI manual are met.

EXAMPLE: *"Which of the following ..." is ambiguous because it does not say "choose all that apply" or "choose the best ...."*

PRESENTATION CONSISTENCY:

At this point in the IQI process, objectives are adequate, test items are consistent with objectives, and test items are adequate. The next instructional design step is to prepare the instructional materials or presentations. The next IQI step is to insure that the presentations are CONSISTENT *with the objectives and test items, and are* ADEQUATE.

In the previous section, determining test-objective consistency involved comparing each test item with its related objective. Determining PRESENTATION CONSISTENCY, *on the other hand, involves checking whether or not each of the INSTRUCTIONAL COMPONENTS required for a given objective-test item is present. There are different types of instructional components. In order to insure consistency, the appropriate components must be present for each TASK/CONTENT level. Not all task/content levels require all components.*

The Instructional PRESENTATION COMPONENTS are:

1. STATEMENT: *The instruction tells the student something he must learn.*

2. EXAMPLES: *The instruction shows the USE of content (concept, procedure, rule, or principle).*

3. PRACTICE: *The student practices REMEMBERING or USING the content, and is given feedback.*

PRESENTATION COMPONENTS:

STATEMENT Component: The instruction presents a statement of a fact, a concept definition, the steps of a procedure or rule, or a statement of a principle.

EXAMPLES:

1. *"The characteristics of a typical jet pump include...." (concept definition).*
2. *"The procedure for changing a gasket in a check valve is ..." (procedure definition).*
3. *"To determine voltage, multiply current by resistance." (rule statement).*

EXAMPLE Component: The student is told or shown how a statement of a concept, procedure, rule, or principle applies in a specific case.

EXAMPLES:

1. *"The XXYZ pump is a double-acting reciprocating pump because it has the particular characteristics noted on the diagram below." (concept example).*
2. *"Let's see how OHM'S LAW applies in a specific case...." (rule example).*
3. *"The Navy's victory at Midway in World War II illustrates the value of cryptologic intelligence because..." (principle example).*

PRACTICE REMEMBERING Component: The student is asked to supply part or all of a fact statement, concept definition, the steps of a procedure or rule, or the statement of a principle. The student is given FEEDBACK about the correctness of his answer.

EXAMPLES:

1. *"The father of our country is _____?" (Fact)*
2. *"List in order the steps of procedure for ...." (Procedure)*

PRACTICE USING Component: The student is asked to use a concept definition, procedure, rule, or principle on a specific case to which it applies, and is given FEEDBACK about the quality of his performance.

EXAMPLES:

1. *"Classify the following Lofargrams." (concept)*
2. *"Using the procedure in the tech. manual, dissassemble the ...." (procedure)*
3. *"Solve the following circuit problems...." (rule)*
4. *"Predict the effect (sociological and psychological) when women are assigned to Navy ships." (principle).*

For CONSISTENCY, different components are required for different task levels:

For the REMEMBER level:	a STATEMENT	*(no example)*	PRACTICE REMEMBERING.
For the USE-UNAIDED level:	a STATEMENT *(or a review of the statement.)*	EXAMPLES *(at least one).*	PRACTICE USING.
For the USE-AIDED level:	*(The aid takes the place of the statement.)*	EXAMPLES WITH AID.	PRACTICE USING WITH AID.

These required components apply across all content types (facts, concepts, procedures, rules, and principles) for REMEMBERING, and all except facts for USING. For example, if the objective and test item called for the student to remember a fact, then the instruction must contain a statement of the fact to be remembered, and at least one practice-remembering item with feedback. No example is required, because it would be redundant with the statement.

CONSISTENCY also requires that each required component meet the following criteria:

1. STATEMENTS must be COMPLETE.

2. EXAMPLES must show application of the complete content.

3. EXAMPLES must match or reflect the conditions and standards required of the objective and the test as closely as possible.

4. PRACTICE must include FEEDBACK.

5. PRACTICE must be of the same task/content level as the test item and objective.

6. PRACTICE must match or reflect the conditions and standards required of the objective and the test as closely as possible, or be designed to help the student gradually learn the final task.

Most of the requirements above are probably obvious, but some are complicated. COMPLETENESS, for example, requires different prescriptions for different content types:

For a CONCEPT: "complete" means that all the critical characteristics of the concept, and their combination, are given.

For a PROCEDURE: "complete" means that all the steps of the procedure are given in the proper order.

For a RULE: "complete" means that all the steps of the rule are given in the proper order.

For a PRINCIPLE: "complete" means that all the pre- and post-conditions, actions, processes, causes, effects, and results are stated, and the relationship between them is clearly stated.

PRESENTATION ADEQUACY

Once all the required instructional components are present, and each of these components meets all of the consistency criteria, the ADEQUACY *of the presentation can be assessed. This is done by checking each instructional component (statement, examples, practice) for certain characteristics.*

A STATEMENT is ADEQUATE if it meets the following criteria:

1. The statement must be SEPARATED from the rest of the instruction. *This helps the student find the main idea. When the statement is separated, the key points stand out, and are not buried in the presentation. There are several ways to accomplish this goal:*

   a. *Set off the statement with boxes.*
   b. *Use a different color.*
   c. *Use a different type, or underline.*
   d. *Place on a separate page, or in a special place on the page.*
   e. *For audio or movies, pause before giving the statement.*

2. The statement must be IDENTIFIED. *After the statement is separated, the student should be told what it is. This permits the student's attention to be focused on the key points and their application, rather than the student trying to become generally familiar with everything in the instruction. One way to identify a statement is to use the word "statement." Other more content-oriented words are even more helpful:*

   definition *procedure for _____* *the principle of _____*

   Main Idea: *Key Point:* *General rule:*

   EXAMPLE:

DEFINITION OF OHM'S LAW:
... ...

   (Here, the statement is separated by the box, and identified.)

3. In addition to the statement, the presentation should include something to help the student better understand and remember the statement. *Methods of providing this help include:*

   a. *Giving a MNEMONIC (memory trick).*
   b. *Giving a general example of how the statement can be used.*
   c. *Explaining why the statement is important.*
   d. *Explaining how it came about, how it fits in the course, or how it relates to something the student already knows.*
   e. *Explaining some of the terms in the statement.*
   f. *Representing the statement with pictures, symbols, flowcharts, tables, etc.*

   EXAMPLE: The following figure can be a helpful memory device for Ohm's. It will help you remember it so you can use it later on.

4. Other adequacy covered in the IQI manual are met.

EXAMPLES are ADEQUATE if they meet the following criteria:

1. EXAMPLES must be SEPARATED and IDENTIFIED.

2. EXAMPLES must include some type of help.

3. EXAMPLES should range from "easy" to "hard."

4. EXAMPLES should be representative of the job the student will do after training.

5. There should be enough examples to cover the content area adequately.

6. EXAMPLES should clearly show why common errors are wrong.

The criteria are generally selp-explanatory. SEPARATED and IDENTIFIED are the same as for statements, and points 3 to 6 need no further explanation. The second criterion, HELP, is applied in different ways for different content types. Some types of HELP for each content type are given below:

HELPS for CONCEPTS:
Highlight the critical characteristics of an example.
Explain why or why not something is classified as a member of a concept.
Show the use of a checklist or heuristic to help classify.
Simplify early examples, e.g.,use line-drawings instead of complicated photographs.

HELPS for PROCEDURES or RULES:
Explain why each step is done.
Explain why each step is important.
Give additional information about how to perform the task.
Give additional information about how to know if you've done it wrong.
Give flowcharts, tables, etc.

HELPS for PRINCIPLES:
Highlight important features.
Simplify the relevant information from the case study in which it is embedded.
Use logical representations of the IF-THEN relationships.
Give additional information about how the principle applies, or why it doesn't.
Give hints as to how to analyze problems.

Other adequacy concerns are given in the IQI manual.

PRACTICE items are ADEQUATE if they meet the following criteria:

1. The PRACTICE section must be SEPARATE and IDENTIFIED.

2. The PRACTICE items must be free of hints that wouldn't be present in the test or on the job.

3. The PRACTICE items should have the same format as the format of the test items.

4. The PRACTICE items should range from easy to hard.

5. The PRACTICE items should be typical of the job to be performed after training.

6. The PRACTICE items should include the opportunity for common errors.

7. The FEEDBACK must also be SEPARATED and IDENTIFIED for each practice item.

8. The FEEDBACK should include help (similar to that for examples). *(As a bare minimum, the FEEDBACK should direct the student back to where the instruction was originally presented. However, it is better to have a new brief presentation, because if the student got the practice wrong, the original presentation didn't help enough.)*

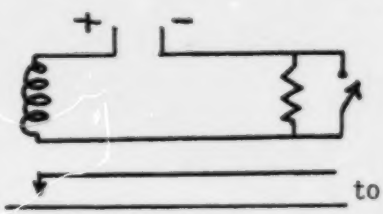
The criteria are also self-explanatory.

Other adequacy concerns are given in the IQI manual.

EXAMPLE: The next example shows an instructional presentation which violates many of the adequacy criteria described above. This example is followed by a more adequate presentation of the same subject matter.

INADEQUATE PRESENTATION on the principles of operation of an alarm circuit:

The alarm circuit senses extremely high temperatures. When an extreme steam temperature occurs (which is a very dangerous condition that may have adverse consequences for a ship and her crew), the sensing switch contacts close,thus shunting the resistor. The decreased resistance in the circuit, according to OHM'S LAW (E=IR), causes an increase in current flow in the circuit, which is enough to operate the alarm relay. The relay is designed to operate at a current flow above that normally found in the circuit. OHM'S LAW states that with voltage constart, a decrease in resistance in the circuit must be accompanied by an increase in current flow. The contacts of the alarm relay then close to actuate the audible alarm device, which may consist of a warning bell with an electrically operated clapper, or an H254 resonated horn assembly. Both of these produce extremely loud signals so they can overcome normal ambient noise levels.



to external audible alarm device.

Why is it important that the alarm circuit be operational at all times? Remember what hot steam can do to ships and sailors.

The example above is inadequate in several ways. First, the principle of operation of the circuit is not separated or identified. How is the student to know what to learn from this presentation? Second, the presentation is cluttered with a lot of other "nice to know" information that really doesn't help. If helps were included, they should aid remembering or understanding the principles of operation of the circuit. Also, the practice is not separate or identified, there is no feedback, and the practice really has nothing to do with remembering the principle.

The next page shows a more adequate presentation.

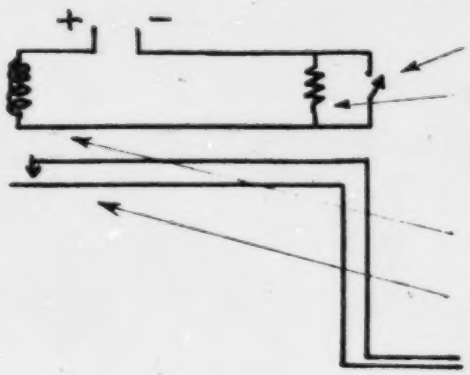
MORE ADEQUATE PRESENTATION on the principles of operation of an alarm circuit:

OPERATION OF THE ALARM CIRCUIT:

(This section describes how the alarm circuit operates)

Extremely high steam temperatures cause the switch to close. This shunts the resistor, because the switch and the resistor are connected in parallel. Circuit resistance is decreased and, therefore, current flow is increased. The increased current flow operates the relay, closes its contacts, and energizes the bell or horn.

BASIC SCHEMATIC



EXPLANATION

1. High temperature closes switch.
2. Switch shunts resistor.
3. Decreased resistance = increased current flow. *(OHM'S LAW)*
4. Increased current operates relay.
5. Relay contacts close.
6. Relay contacts energize bell or horn.

PRACTICE: *Without using references or notes, explain how an alarm circuit operates. Be sure to include in your explanation the important actions that take place in the circuit. (Answer on pg. 256.)*

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ANSWER TO PRACTICE QUESTION: *There are several ways you could have explained the operation of the alarm circuit, but your answer should have included the following ideas:*

1. *High temperature causes the switch to close.*
2. *When the switch closes it reduces total resistance in the circuit.*
3. *Decreased resistance means increased current flow.*
4. *The increased current flow operates the relay.*
5. *The relay contacts close and operate the bell or horn.*

USING THE IQI:

The IQI is designed for Quality Control during any objectives-based instructional development process.

There are four documents that comprise the IQI:

1. Introduction and Overview *(This document)*

2. User's Manual *(contains all IQI procedures, and examples of their use)*

3. Workbook *(contains practice on all IQI procedures, with feedback)*

4. Job Performance Aid *(short version of all procedures)*

To facilitate use of the IQI procedures, the User's Manual, Workbook, and JPA were designed to include three quality control forms: The first form assesses objective adequacy, and the second is used to determine test consistency and test adequacy, and the third evaluates objective-presentation consistency and presentation adequacy. The suggested use of these forms is as follows:

1. Either during, or immediately after, the development of objectives in instructional development, use the objective adequacy form to assess the adequacy of each objective. Any required revisions should be made before instructional development proceeds.

2. As test items are developed for each objective, they should be checked for consistency with objectives, and adequacy, using the second form.

3. As new instructional materials are developed, or as existing materials are adopted, they are checked for consistency with objectives, and adequacy, using the third form. Required revisions to materials and tests are made before they are subjected to individual or small-group try-outs.

FOR MORE INFORMATION:

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